

Remarks

This is a full and complete response to the Office action dated March 16, 2011. Favorable reconsideration of the claims is respectfully requested.

REGARDING THE CLAIMS:

Claims 36, 39, 41-46, 49, 51-55 are pending in the application with claims 46, 39, 41, 46, 49, 51 being amended herewith and new claim 60 added. No new matter has been added.

The Final Office action of March 16, 2011 indicated that claims 40-45 and 50-55 are objected to but would be allowable if rewritten in independent form. Accordingly claim 36 has been amended to include the limitations of 37 and 40. Additionally, claim 46 is amended to include the limitations of claim 50. The remaining dependent claims are allowable by virtue of their dependency on either claim 46 or claim 50. Thus the Rejections noted in the Office action of December 16, 2011 are obviated. Accordingly, Applicants submit that all remaining claims are in condition for allowance, and timely Notice to that effect is respectfully requested.

Further to the above, claim 36 has been rewritten as claim 60 without the above noted amendments and thus is the same as claim 36 in the amendment of March 16, 2010 in order to address the arguments presented by the Examiner.

REJECTION UNDER 35 U.S.C. § 103 – AINE IN VIEW OF KATO :

Claims 36, 38, 39, 46, 48 and 49 and 56-59 stand rejected under 345 USC §103(a) as being unpatentable over Aine, US 3,903,694 (hereinafter “Aine”) in view of Henis et al., US 4,230,463 (hereinafter “Henios”), and Kato et al., US 5,953,907, (hereinafter “Kato”).

As new claim 60 is the same as claim 36 as amended in the Response of December 16, 2011 the above rejection is discussed as follows.

The Examiner recited on pages 7-8 of the Office action a passage from Henis as follows:

In accordance with this invention, the multicomponent membranes for gas separation comprise a porous separation membrane having feed and exit surfaces and a coating material in contact with the porous separation membrane. The porous separation membrane has essentially the same composition, or material, throughout its structure, i.e., the porous separation membrane is substantially

chemically homogenous. The material of the porous separation membrane exhibits selective permeation for at least one gas of a gaseous mixture over that of at least one remaining gas of the mixture, and hence the porous separation membrane is defined as a "separation" membrane. **By describing the separation membrane as "porous" it is meant that the membrane has continuous channels for gas flow, i.e., pores, which communicate between the feed surface and exit surface.** These continuous channels, if sufficiently large in number and in cross-section, can permit essentially all of a gaseous mixture to flow through the porous separation membrane with little, if any, separation due to interaction with the material of the porous separation membrane. (emphasis added) *Henis, col. 7, lines 25-30.*

From the highlighted portions above, it is concluded in the Office action that Henis discloses a porous membrane which exhibits selective permeation of at least one gaseous component. However, the underlined portion and highlighted in the Office action ignores the parts of the disclosure which show that the membrane **is treated with a coating in occluding contact with the membrane – thus changing its operation.**

Applicants respectfully note that the sentences immediately following the above passage are ignored, and which clearly show that in Henis the separation is not due to the molecular form and size of the gas but due to the intrinsic properties. For example:

These continuous channels, if sufficiently large in number and in cross-section, can permit essentially all of a gaseous mixture to flow through the porous separation membrane with little, if any, separation due to interaction with the material of the porous separation membrane. This invention advantageously provides multicomponent membranes wherein the separation of at least one gas from a gaseous mixture **by interaction with the material** of the porous separation membrane is enhanced, as compared to that of the porous separation membrane alone. (emphasis added) *Henis, col. 7, lines 25-30.*

In order to prevent gases from passing through the pores, Henis provides an occluding coating on the membrane. As is stated:

The coating is preferably in occluding contact with the porous separation membrane such that, with respect to the models which have been developed based on observation of the

performance of the multicomponent membranes of this invention, **increased resistance to the passage of gases through the pores of the separation membrane is provided**, and the proportion of gases passing through the material of the porous separation membrane to gases passing through the pores is enhanced over that proportion using the porous separation membrane not having the coating. *Henis, col. 22, lines 12-23.*

Accordingly, the coating is provided to prevent the passage of gases through the pores of the membrane. Moreover, when discussing the size of the molecules, it is indicated they should fit the size of the pores:

If the molecular size of the material of the coating is too large to be accommodated by the pores of the porous separation membrane, the material may not be useful to provide occluding contact. **If, on the other hand, the molecular size of the material for the coating is too small, it may be drawn through the pores of the porous separation membrane during coating and/or separation operations**. Thus with porous separation membranes having larger pores, it may be desirable to employ materials for coating having larger molecular sizes than with smaller pores. (emphasis added) *Henis, col. 19, lines 25-35.*

Accordingly it is not desirable for the coating to be so small as to be drawn through the pores, but instead to be sized to fit therein.

Finally, when discussing the porosity of the membrane, Henis indicates that a lower pore range is desirable so as to increase the area of the material of the membrane.

The porous separation membranes significantly affects the separation of the multicomponent membranes of this invention, and accordingly, **it is desirable to provide a large ratio of total surface area to total pore cross-sectional area in the porous separation membrane**. (emphasis added) *Henis, col. 21, lines 48-53.*

Thus Henis intends to have a large surface area of material rather than pores for separations. Furthermore, the coating is supposed to have a much higher permeability rate than the membrane. *Henis, col. 19, lines 1-7.*

From the above portions, it is clear that the separation of gases is not due to the molecular form and size of the gas but due to the intrinsic properties of the membrane material.

The examples of Henis also support this view. Examples 2 and 3 (see Table 1) show the separation properties of the same multi-component membrane but for two different gases, i.e. for O₂ and H₂. If a membrane can be used for the separation of two different gases, the separation mechanism is most likely not propelled by the molecular form and size of the gases which are permeated through the membrane.

Accordingly, in view of the above, none of the cited references, taken alone or in combination disclose, teach or suggest the present claims.

REJECTION UNDER 35 U.S.C. § 103 – AINE IN VIEW OF HENIS, KATO AND CASEY :

Claims 37 and 47 stand rejected under 345 USC §103(a) as being unpatentable over Aine, in view of Henis and Kato and further in view of Casey, US 5,661,973 (hereinafter “Casey”).

Applicants note that claims 37 and 47 have been canceled thus rendering the above rejection moot.

In view of the foregoing as well as the previous Remarks, Applicants submit that all pending claims are in condition for allowance, and timely Notice to that effect is respectfully requested.

The undersigned representative requests any extension of time that may be deemed necessary to further the prosecution of this application.

The undersigned representative authorizes the Commissioner to charge any additional fees under 37 C.F.R. 1.16 or 1.17 that may be required, or credit any overpayment, to Deposit Account No. 14-1437, referencing Attorney Docket No.: 0173.019.PCUS00.

In order to facilitate the resolution of any issues or questions presented by this paper, the Examiner may directly contact the undersigned by phone to further the discussion.

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